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PROCESSING VEGETABLE RESEARCH REPORT - 1995

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INTRODUCTION

This report summarizes the results of several processing vegetable studies conducted during 1995 as well as summaries of 3-year studies that were conducted from 1993-1995. Weather data for the '95 growing season are included at the end of this report. All cultural information and spray applications are also listed.

The excellent cooperation of branch/farm managers and employees Ken Scaife and Mark Schmittgen, Sean Mueller, and Ken DeWeese; Dr. Winston Bash and Gary Wenneker (OSU Pilot Plant, Columbus); Robert E. Moore, Jr., student research assistant ; Jabe Warren , graduate research assistant and many others is greatly appreciated. We hope that this type of information is of benefit to the processing vegetable industry in Ohio and the Great Lakes region. Your comments and suggestions for future efforts are always welcome.

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PROCESSING TOMATO PLANT POPULATION STUDY

Objective:

To compare processing tomato development, fruit set, fruit size and yields using a range of single and twin-row plant populations (6,000 to 18,000 plants/A) and three processing tomato cultivars, 'OH8245', 'P696', and 'H7135'.

Materials and Methods:

Single and twin-row comparisons for 6,000, 9,000, 12, 000, 15,000, and 18,000 plants/A were established for 'OH8245', 'P696', and 'H7135' at the Vegetable Crops Branch, Fremont, OH, on May 23, 1995. Each treatment was replicated three times. Rows were 30' long and spaced on 5' centers.

Results and Discussion:

Plant spacing had a significant effect in 1995 on fruit yields of all three cultivars (Table 1). Optimum red fruit yields (Figure 1A) were achieved at 15,000 plants/A in twin rows for 'OH8245'; which is similar to our results from 1994. Twin-row 'OH8245' yields in 1995, however, were significantly greater than single-row yields for all populations studied. Optimum fruit yields for 'P696' (Figure 1B) were obtained at twin row populations of 12,000 - 18,000 plants/A in 1995. Yields of 'H7135' (Figure 2) showed best red fruit yields at double row population of 15,000 plants/A.

This study was also conducted in 1993 and 1994. A three year average of data for 'OH8245' (medium vine-type consistently used all three years of this study) shows no significant differences in single or twin row populations of 6,000 to 18,000 plants/A (Table 2.) However, optimum red fruit and red & green fruit yields were obtained at 12,000 - 18,000 plants/A in twin rows (Figure 3). Yields varied considerably in the three years of this field research (Figure 4), but twin rows provided significant yield gains in two of three years for populations of 12,000 plants/A or greater.

Table 1. 1995 PLANT POPULATION STUDY, Fremont, OH.

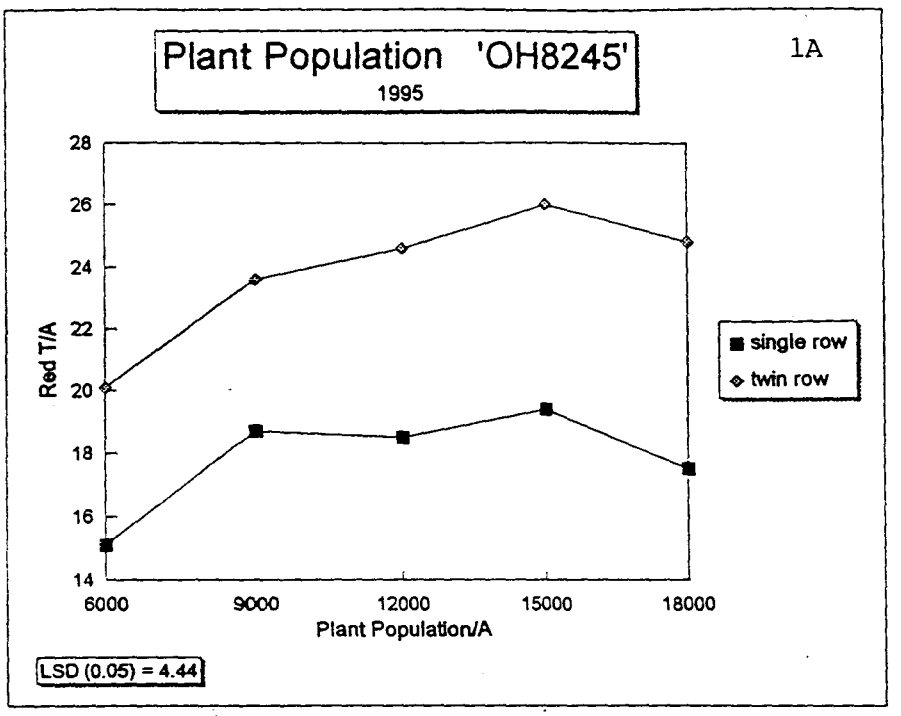
Cultivar	Row	Plant Population/A	Red T/A	Green T/A	Red&Green T/A	Rot T/A	% Red	Avg. # Red Fruit/Plant	Avg. Red Fruit Wt. (lbs)	Avg. Wt. of Red Fruit/ Plant (lbs)	Avg. # Green Fruit/Plant	Avg. Green Fruit Wt. (lbs)	Avg. Wt. of Green Fruit/ Plant (lbs)	Plant Fresh Wt. (gm)
'Peto 696'	Single	6,000	17.8	2.1	19.9	1.6	83	114	.08	9.8	22	.06	1.27	1203
"	Single	9,000	20.1	0.9	21.0	2.3	86	100	.08	8.4	9	.06	0.57	598
"	Single	12,000	20.0	1.9	21.9	2.0	83	62	.08	4.9	12	.04	0.53	303
"	Single	15,000	19.6	1.6	21.2	2.2	84	65	.08	5.0	8	.05	0.40	469
"	Single	18,000	18.4	0.7	19.1	1.9	87	51	.07	3.5	2	.06	0.13	265
"	Double	6,000	17.6	2.4	20.0	0.8	85	119	.09	11.0	11	.07	0.89	923
"	Double	9,000	21.6	1.0	22.6	1.1	91	96	.08	7.6	8	.04	0.32	515
"	Double	12,000	25.4	1.5	26.9	0.8	92	85	.09	7.4	6	.06	0.38	719
"	Double	15,000	25.4	0.7	26.1	1.3	93	70	.07	5.1	2	.06	0.08	431
"	Double	18,000	25.4	1.0	26.4	0.8	93	63	.07	4.3	4	.03	0.12	333
LSD (0.05)			3.31	0.36	3.56	NS	6.0	30.6	0.01	2.51	7.4	NS	0.62	330.5
p value						0.189						0.342		
CV			16.4	58.4	14.7	61.1	5.6	33.3	11.7	40.6	79.7	38.9	100	57.3

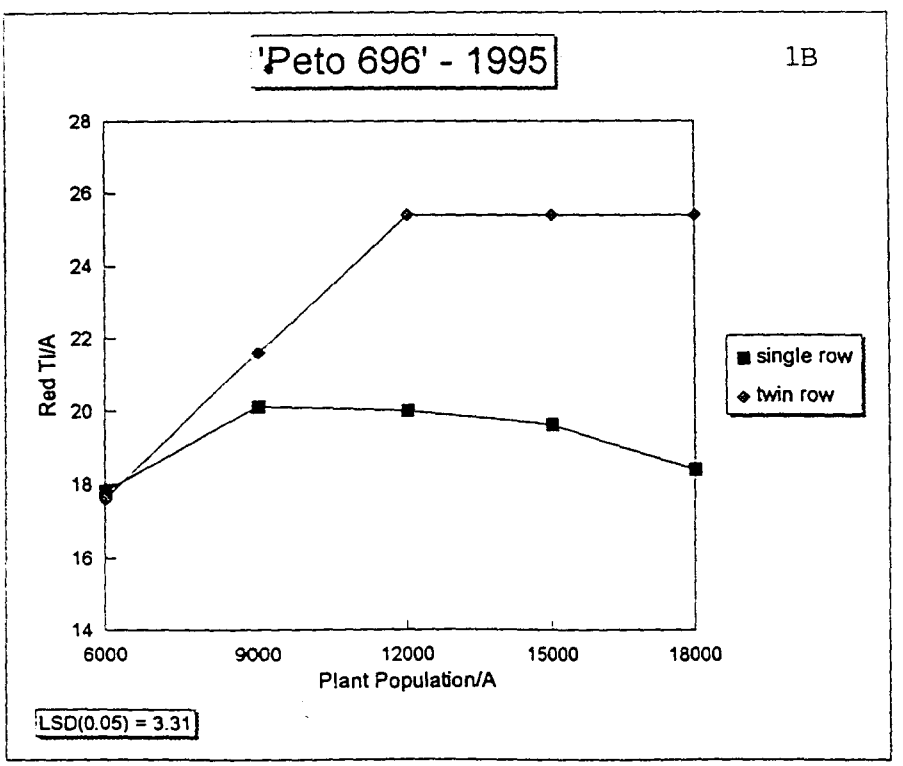
Cultivar	Row	Plant Population/A	Red T/A	Green T/A	Red&Green T/A	Rot T/A	% Red	Avg. # Red Fruit/Plant	Avg. Red Fruit Wt. (lbs)	Avg. Wt. of Red Fruit/ Plant (lbs)	Avg. # Green Fruit/Plant	Avg. Green Fruit Wt. (lbs)	Avg. Wt. of Green Fruit/ Plant (lbs)	Plant Fresh Wt. (gm)
'H7135'	Single	6,000	13.1	0.7	13.8	1.7	84	82	.08	6.5	7	.02	.20	537
"	Single	9,000	12.1	0.3	12.4	2.1	83	75	.08	5.7	5	.02	.13	439
"	Single	12,000	13.1	0.3	13.4	2.1	84	65	.08	5.0	4	.03	.13	371
"	Single	15,000	13.2	0.3	13.5	2.2	84	65	.07	4.6	5	.01	.07	356
"	Single	18,000	14.7	0.4	15.1	1.3	90	51	.07	3.8	5	.02	.10	318
"	Double	6,000	13.6	0.3	13.9	1.0	92	95	.08	7.6	6	.02	.13	552
"	Double	9,000	16.7	0.2	16.9	1.2	92	67	.08	5.5	3	.01	.05	446
"	Double	12,000	17.9	0.2	18.1	1.4	92	60	.08	4.7	3	.02	.07	424
"	Double	15,000	18.9	0.3	19.1	1.2	92	71	.07	5.1	4	.01	.05	484
"	Double	18,000	17.4	0.2	17.6	1.5	91	54	.07	3.8	2	.03	.05	280
LSD (0.05)			3.62	NS	3.75	NS	NS	24.3	NS	1.88	NS	NS	NS	117.3
p value				0.465		0.412	0.180		0.428		0.193	0.173	0.298	
CV			19.5	86.0	19.1	47.7	7.0	25.3	9.5	28.0	55.0	51.8	81.8	24.7

Cultivar	Row	Plant Population/A	Red T/A	Green T/A	Red&Green T/A	Rot T/A	% Red	Avg. # Red Fruit/Plant	Avg. Red Fruit Wt. (lbs)	Avg. Wt. of Red Fruit/ Plant (lbs)	Avg. # Green Fruit/Plant	Avg. Green Fruit Wt. (lbs)	Avg. Wt. of Green Fruit/ Plant (lbs)	Plant Fresh Wt. (gm)
'OH 8245'	Single	6,000	15.1	2.7	17.8	1.5	78	71	0.10	6.8	20	0.09	2.0	1120
"	Single	9,000	18.7	2.1	20.8	2.0	82	38**	0.15**	5.5	5**	0.06**	0.3	787
"	Single	12,000	18.5	1.9	20.4	1.9	82	59	0.09	5.6	9	0.06	0.5	696
"	Single	15,000	19.4	2.2	21.6	1.7	83	55	0.05**	3.8**	6	0.05**	0.3	575
"	Single	18,000	17.5	1.2	18.7	2.1	84	42**	0.08**	3.6	7**	0.05**	0.2	515
"	Double	6,000	20.1	1.8	21.9	1.9	84	101**	0.10**	9.5	11**	0.06**	0.5	1423
"	Double	9,000	23.6	1.1	24.7	2.3	88	79**	0.09**	6.9	3**	0.04**	0.1	1029
"	Double	12,000	24.6	1.5	26.1	2.4	87	68**	0.09**	5.3	3**	0.07**	0.3	741
"	Double	15,000	26.0	1.2	27.2	2.5	87	49*	0.08*	4.4**	4*	0.06*	0.2**	590**
"	Double	18,000	24.8	1.3	26.1	3.0	85	44**	0.07**	3.0**	4**	0.04**	0.2**	386**
LSD (0.05)			4.44	0.95	4.78	0.77	4.6							
p value														
CV			19.9	41.3	17.5	26.1	4.3	74.2	52.6	52.4	58.6	79.0	73.1	61.8

* data collected from 1 replication
** data collected from 2 replications

Figs. 1A and 1B. Effects of plant population and single vs. twin row spacing on processing tomato fruit yields of cultivars 'OH8245' and 'P696', Fremont, OH.





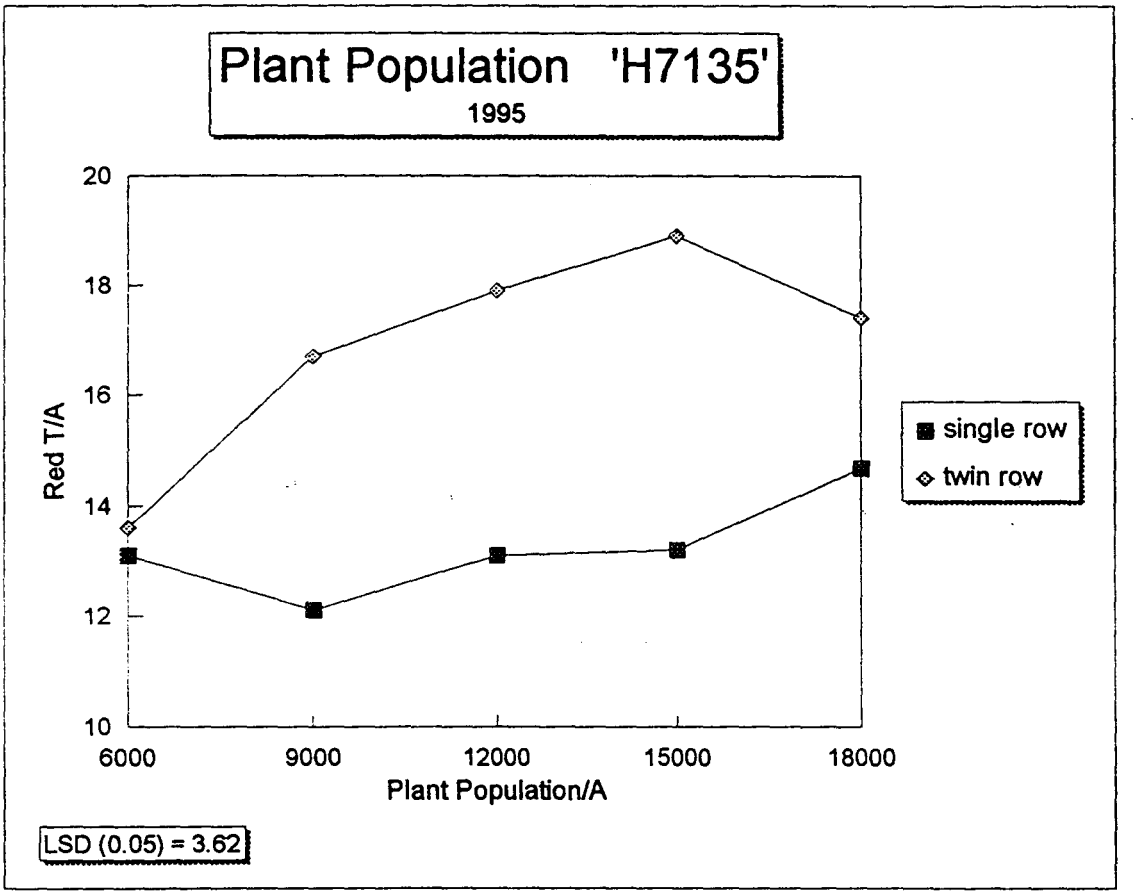


Fig. 2. Effects of plant population and single vs. twin row spacing on processing tomato fruit yields of cultivar 'H7135', Fremont, OH.

Table 2. Plant Population Study, Fremont, OH.
Cultivar: 'OH8245' - 3 year averages

Row	Plant Population/A	Red T/A	Green T/A	Red & Green T/A	% Red	Culls T/A
Single	6000	26.8	4.3	31.3	82	1.3
Single	9000	28.2	3.2	31.4	85	1.6
Single	12000	28.6	3.4	32.0	84	1.8
Single	15000	30.1	3.9	34.0	84	1.7
Single	18000	28.6	3.5	32.1	84	2.1
Double	6000	27.3	3.2	30.5	84	1.8
Double	9000	29.9	2.7	32.6	86	2.2
Double	12000	32.4	3.2	35.6	86	2.3
Double	15000	34.7	2.7	37.4	87	2.2
Double	18000	33.0	2.9	35.9	86	2.5
LSD (0.05)		NS	NS	NS	NS	0.70
p value		0.994	0.999	0.999	0.646	
CV		30.3	67.3	33.0	3.2	25.8

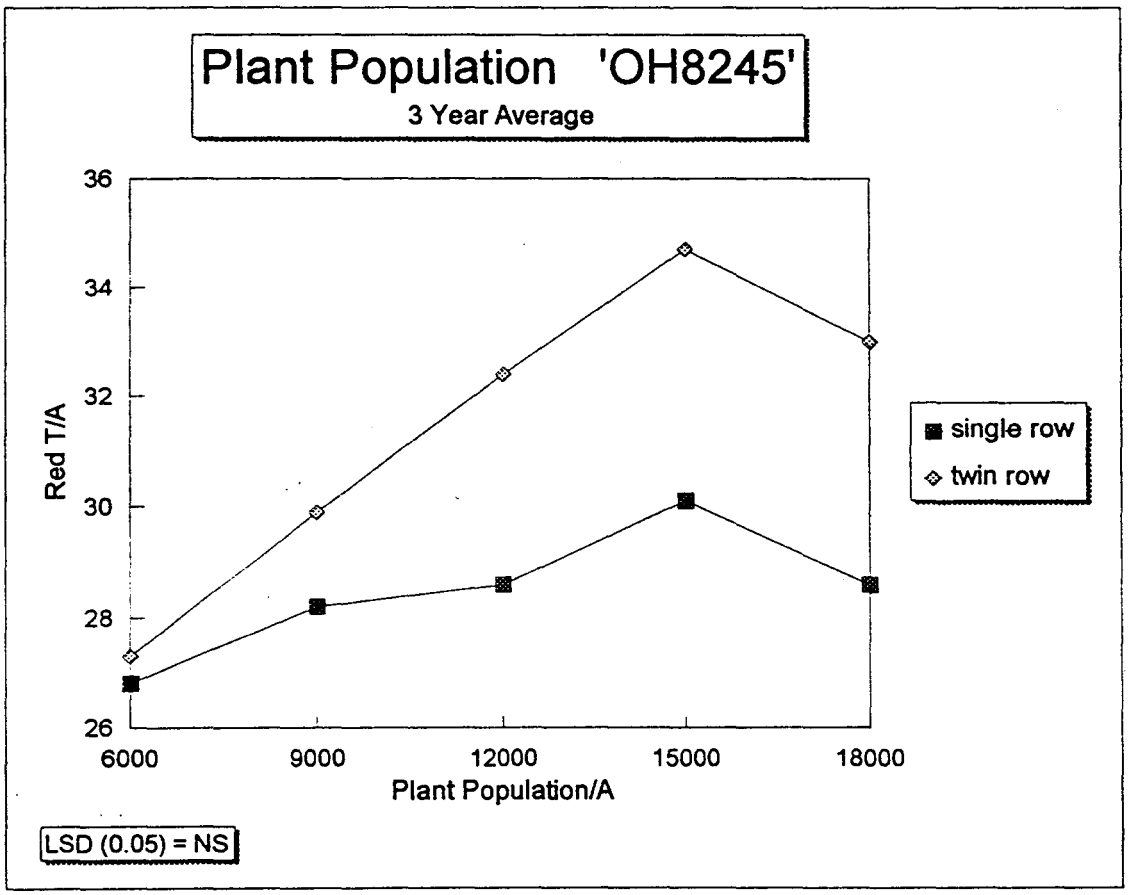


Fig. 3. Effects of plant population and single vs. twin row spacing on processing tomato fruit yields of cultivar 'OH8245'; a 3 year average (1993-1995), Fremont, OH.

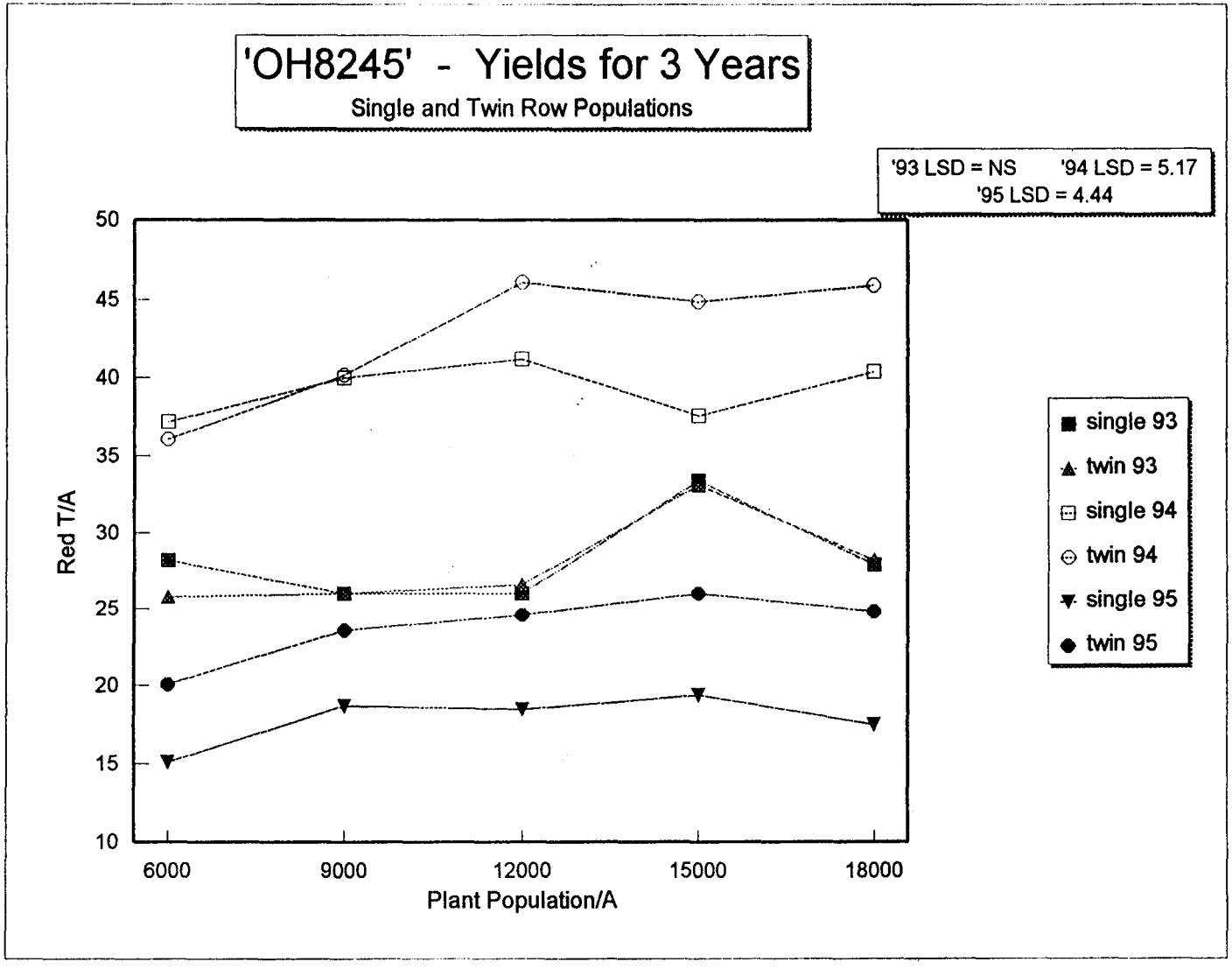


Fig. 4. Effect of plant population and single vs. twin row spacing on processing tomato fruit yields of cultivar 'OH8245' over 3 years (1993-1995), Fremont, OH.

THE EFFECTS OF DCPTA ON PROCESSING TOMATOES

Objective: Evaluate the potential of DCPTA [2-(3, 4-dichlorophenoxy) triethylamine] to increase tomato yields and solids. DCPTA is a naturally occurring bioregulator which has sporadically increased tomato solids in California and Ohio research.

Materials and Methods: 'H7145' was used in the study in 1993, 1994, and 1995. Treatments used were a pregermination seed soak using DCPTA, a pregermination seed soak using a Tween™ control, an untreated control, and a foliar application of DCPTA applied to plants at the 6-7 leaf stage. Plots in 1995 were established at the Veg. Crops Branch, Fremont, OH on June 6. Rows were 30 feet long on 5 foot centers. Standard disease and pest management practices were followed. Plots were machine harvested on August 30.

Results and Discussion: There were no significant differences in red fruit yields or solids in 1995 (Table 3) or in comparing the data across three years (Table 4). Results for pH, color and acidity also showed no differences among the four treatments. This three year project is now completed.

Table 3. Effects of DCPTA on Processing Tomatoes - 1995

Fremont, OH
Cultivar: 'H7145'

Treatment	Red T/A	Green T/A	Red & Green T/A	Cull T/A	pH	% Acidity	Brix	Color*
DCPTA seed soak	22.4	1.5	23.9	5.2	4.1	0.314	2.5	62.5
Tween Control	19.3	1.2	20.5	5.2	4.1	0.314	2.8	59.0
DCPTA/foliar spray	22.7	1.2	23.9	5.1	4.1	0.307	2.9	64.7
Control	22.6	1.5	24.1	4.5	4.2	0.305	2.6	64.2
LSD	NS	NS	NS	NS	NS	NS	NS	NS
p value	0.665	0.372	0.328	0.365	0.606	0.873	0.275	0.784
CV	19.3	26.9	33.3	13	2.5	4.4	10.2	12.9

* color determined by Agtron model E-5M

Table 4. Effects of DCPTA On Processing Tomatoes - 3 Year Averages (1993-1995; Fremont, OH)
Cultivar : 'H7145'

Treatment	Red T/A	Green T/A	Red & Green T/A	Cull T/A	pH	% Acidity	Brix	Agtron
DCPTA seed soak	31.6	2.6	34.2	2.9	4.1	0.299	3.3	57.3
Tween Control	34.9	2.4	37.3	3.1	4.1	0.290	3.3	56.0
DCPTA foliar spray	31.2	2.5	33.7	3.0	4.1	0.288	3.3	58.3
Control	30.9	2.8	33.7	2.6	4.1	0.296	3.3	58.6
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS
p value	0.969	0.994	0.981	0.985	0.838	0.972	1.000	0.901
CV	30.5	56.0	32.1	56.4	1.4	9.9	24.3	7.0

ACA™ RATE COMPARISONS ON GROWTH, YIELD, AND QUALITY OF PROCESSING TOMATOES

Objective: Processing tomato growers and processors in the Great Lakes region are eager for ways to make production of this high-value crop even more efficient. This research conducted in 1993, 1994 and 1995 looked at different levels of ACA™ applied at transplant.

Materials and Methods: 1995 was the third year of testing ACA™ on processing tomato cultivars. In all years, plots were established at the Veg. Crops Branch, Fremont, on raised beds 30 feet long on 5 foot centers. Plots in 1995 were planted on June 6. ACA™ is applied at transplant along with starter fertilizer. All other cultural practices follow standard recommendations. Six levels of ACA™(4, 8, 12, 16, 20, and 24 oz/A) on one cultivar ('OH8245') along with foliar samples were collected in 1993. These same levels on 'OH8245' were compared in 1994 along with detailed sampling of root data (shoot:ratio) at 2, 4, 6, 8, and 10 weeks after transplant. In 1995 cultivars ('OH8245', 'H7135', and 'Peto 696') were tested with 2 levels of ACA™ (4 and 12 oz/A) applied. Plant and root samples were also taken to determine a shoot:root ratio at 2, 4, and 6 weeks after transplant.

Results and Discussion: There were no significant differences in red fruit yields or foliar analysis in 1993. 1994 results again showed no differences in yield or solids; however, solids were slightly higher at 2 ACA™ levels (8 and 12 oz/A). Shoot:root ratios in 1995 (Table 5) were not significant for 'OH8245' or 'Peto 696' for any of the 3 sampling dates. Differences were significant for samples taken from 'H7135' plots when sampled 4 weeks after transplanting Results from 1995 showed no differences in red fruit yields for 'OH8245' and 'H7135'. Red fruit yields were statistically different for 'Peto 696', showing optimum yields reached when 4 oz/A of ACA™ was applied at transplant (Table 6). Soluble solids for all three cultivars in 1995 showed no significant differences. A summary of results for 'OH8245' at 4 and 12 oz/A ACA™ over the three years shows no significant differences in fruit yields or solids (Table 7).

Table 5. Effects of ACA on Processing Tomato Growth - 1995 (Fremont, OH).

Cultivar: ' OH8245'	2 wks. after transplant			4 wks. after transplant			6 wks. after transplant			
	Plant Dry	Root Dry	Shoot:Root	Plant Dry	Root Dry	Shoot:Root	Plant Dry	Root Dry	Shoot:Root	
Treatment	Wt. (g)	Wt. (g)	Ratio	Wt. (g)	Wt. (g)	Ratio	Wt. (g)	Wt. (g)	Ratio	Fruit Wt.(g
Starter Fertilizer Only	7.0	0.5	14.5	137.3	4.3	31.9	152.4	7.3	20.7	0.5
4 oz ACA/A + starter fert.	6.7	0.5	13.2	146.6	5.3	21.0	171.9	8.2	21.7	0.8
12 oz ACA/A + starter fer	7.0	0.6	12.2	111.7	3.7	31.9	187.3	8.0	23.4	0.5
LSD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
p value	0.914	0.628	0.513	0.064	0.092	0.250	0.532	0.833	0.320	0.166
CV	15.4	22.0	20.0	17.3	23.5	36.7	24.1	26.0	10.8	33.9

Cultivar: H7135	2 wks. after transplant			4 wks. after transplant			6 wks. after transplant			
	Plant Dry	Root Dry	Shoot:Root	Plant Dry	Root Dry	Shoot:Root	Plant Dry	Root Dry	Shoot:Root	
Treatment	Wt. (g)	Wt. (g)	Ratio	Wt. (g)	Wt. (g)	Ratio	Wt. (g)	Wt. (g)	Ratio	Fruit Wt.(g
Starter Fertilizer Only	7.3	0.55	13.3	126.6	3.1	41.5	140.1	6.8	21.6	0.8
4 oz ACA/A + starter fert.	9.2	0.33	27.4	134.8	4.4	31.5	165.4	7.8	21.0	0.9
12 oz ACA/A + starter fer	8.5	0.59	14.7	149.3	4.3	34.8	156.5	6.1	25.5	0.8
LSD	NS	0.12	NS	NS	0.97	7.87	NS	NS	NS	NS
p value	0.662		0.079	0.138			0.503	0.367	0.177	0.744
CV	33.7		54.5	12.0			18.9	23.6		

Cultivar: Peto 696	2 wks. after transplant			4 wks. after transplant			6 wks. after transplant			
	Plant Dry	Root Dry	Shoot:Root	Plant Dry	Root Dry	Shoot:Root	Plant Dry	Root Dry	Shoot:Root	
Treatment	Wt. (g)	Wt. (g)	Ratio	Wt. (g)	Wt. (g)	Ratio	Wt. (g)	Wt. (g)	Ratio	Fruit Wt.(g
Starter Fertilizer Only	7.3	0.5	13.2	138.6	4.7	33.9	203.9	9.0	23.7	0.7
4 oz ACA/A + starter fert.	5.9	0.5	13.7	140.4	5.0	29.6	193.3	7.7	25.4	0.8
12 oz ACA/A + starter fer	6.5	0.5	13.7	152.2	4.9	32.6	177.6	8.9	19.7	0.7
LSD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
p value	0.309	0.561	0.909	0.490	0.971	0.842	0.631	0.576	0.158	0.841
CV	19.8	24.2	13.0	11.4	31.6	30.6	18.9	21.6	18.6	38.6

Table 6. Effects of ACA on Processing Tomato Harvest Variables - 1995 (Fremont, OH).

Cultivar: OH8245

Treatment	Red T/A	Green T/A	Red & Green T/A	Culls T/A	Brix	Color*
Starter Fertilizer Only	20.4	6.1	26.5	2.4	3.3	58.3
4 oz ACA/A + starter fertilizer	20.3	5.8	26.1	2.4	3.2	57.7
12 oz ACA/A + starter fertilizer	21.8	5.6	27.4	2.6	3.2	55.0
LSD	NS	NS	NS	NS	NS	NS
p value	0.515	0.923	0.829	0.837	0.653	0.731
CV	9.2	27.5	9.8	19.9	3.3	10.1

Cultivar : H7135

Treatment	Red T/A	Green T/A	Red & Green T/A	Culls T/A	Brix	Color*
Starter Fertilizer Only	16.0	2.8	18.8	1.4	3.1	68.9
4 oz ACA/A + starter fertilizer	15.4	2.3	17.7	1.4	3.3	65.7
12 oz ACA/A + starter fertilizer	15.5	2.6	18.1	1.4	3.2	72.1
LSD	NS	NS	NS	NS	NS	NS
p value	0.859	0.321	0.636	0.948	0.445	0.608
CV	9.0	19.4	8.5	18.6	8.2	12.2

Cultivar : Peto 696

Treatment	Red T/A	Green T/A	Red & Green T/A	Culls T/A	Brix	Color*
Starter Fertilizer Only	18.0	2.8	20.8	2.9	3.3	61.7
4 oz ACA/A + starter fertilizer	22.8	4.1	26.9	3.6	3.3	62.2
12 oz ACA/A + starter fertilizer	20.8	3.0	23.8	3.8	3.1	58.2
LSD	3.58	NS	4.47	0.46	NS	NS
p value		0.301			0.488	0.763
CV		38.8			6.5	12.7

* color determined by Agtron model E-5M

Table 7. ACA on Processing Tomatoes (Cv: 'OH8245'); Averages for 3 Years (1993-1995; Fremont, OH).

Treatment	Red T/A	Green T/A	Red & Green T/A	Culls T/A	Brix	Agtron
Starter Fertilizer Only	33.0	5.6	38.6	1.6	3.35	59.8
4 oz ACA/A +Starter Fertilizer	33.1	5.2	38.3	1.7	3.41	61.6
12 oz ACA/A +Starter Fertilizer	32.1	5.4	37.5	1.8	3.50	61.6
LSD (0.05)	NS	NS	NS	NS	NS	NS
p value	0.995	0.860	0.995	0.977	0.876	0.857
CV	34.8	15.8	30.4	51.4	9.6	6.5

THE EFFECT OF NITROGEN LEVELS AND FRUIT MATURITY ON TOMATO PEELING EFFICIENCY - 1995

Co-Investigators: Dr. Winston Bash, Food Industries Center, Ohio State Univ.
Dr. Sheryl Barringer, Food Science and Technology, Ohio State Univ.

Objective: to provide fruit of commercially important processing tomato cultivars grown under standard production practices. A range of nitrogen rates and fruit maturities were studied for effects on tomato peeling and fundamental fruit structure. This year initial studies were done and more detailed information will be collected in 1996.

Methods and Materials: Processing tomatoes (cvs. 'OH8245', 'P696', and 'SO12') were established using transplants in twin rows on raised beds at the Veg. Crops Branch, Fremont, Ohio. Plants were transplanted to the field on May 23. Plots (3 reps) were 60' long to permit harvest at two or three stages of fruit maturity. Nitrogen rates (0, 50, 100, 150 lbs/A) were varied to study impact on peeling efficiency and yield. All N levels were established with ½ the total amount broadcast preplant and the ½ sidedressed approximately 3 weeks after plant establishment. All other production practices (disease/insect managment, weed control, ethephon application, etc.) followed standard recommendations for the midwest U.S.

Plant tissue analysis (N, P, K, Ca, Mg, Mn, Fe, Cu, Zn, B, Al, Na) was conducted at first fruit set and again prior to harvest. Hand harvested fruit was graded and weighed and transported to the OSU Pilot Plant, Columbus, where Dr. Bash and Dr. Barringer tested samples for peeling efficiency and fruit structure.

Results to Date : See Table 8 for yield data and Tables 9 and 10 for foliar sample results.

Table 8. THE EFFECT OF NITROGEN LEVELS AND FRUIT MATURITY ON TOMATO PEELING EFFICIENCY - 1995 (Fremont, OH).

Cultivar: 'OH8245'

Treatment	Red (T/A)	Green (T/A)	Culls (T/A)
0 lbs N/A	16.1	1.3	2.5
50 lbs N/A	21.9	2.0	3.0
100 lbs N/A	23.0	2.0	3.6
150 lbs N/A	24.3	2.6	3.2
LSD (0.05)	3.92	NS	NS
p value		0.067	0.381
CV	17.6	32.7	24.6

Cultivar: 'Peto 696'

Treatment	Red (T/A)	Green (T/A)	Culls (T/A)
0 lbs N/A	15.9	0.7	2.4
50 lbs N/A	18.6	0.9	3.4
100 lbs N/A	22.8	1.4	4.1
150 lbs N/A	20.9	2.0	3.0
LSD (0.05)	2.06	0.68	NS
p value			0.051
CV	14.8	48.0	24.4

Cultivar: 'SO12'

Treatment	Red/Grn/Culls (T/A)
0 lbs N/A	17.0
50 lbs N/A	18.8
100 lbs N/A	18.9
150 lbs N/A	22.0

'OH8245' and 'Peto 696'

Cultivar	Treatment	Red (T/A)	Green (T/A)	Culls (T/A)
'OH8245'	0 lbs N/A	16.1	1.3	2.5
"	50 lbs N/A	21.9	2.0	3.0
"	100 lbs N/A	23.0	2.0	3.6
"	150 lbs N/A	24.3	2.6	3.2
'Peto 696'	0 lbs N/A	15.9	0.7	2.4
"	50 lbs N/A	18.6	0.9	3.4
"	100 lbs N/A	22.8	1.4	4.1
"	150 lbs N/A	20.9	2.0	3.0
LSD (0.05)		3.00	0.75	NS
p value				0.125
CV		16.3	43.9	24.0

'OH8245', 'Peto 696', and 'SO12'

Cultivar	Treatment	Red/Grn/Culls (T/A)
'OH8245'	0 lbs N/A	21.6
"	50 lbs N/A	26.9
"	100 lbs N/A	28.7
"	150 lbs N/A	30.1
'Peto 696'	0 lbs N/A	18.6
"	50 lbs N/A	22.8
"	100 lbs N/A	28.3
"	150 lbs N/A	26.0
'SO12'	0 lbs N/A	17.0
"	50 lbs N/A	18.8
"	100 lbs N/A	18.9
"	150 lbs N/A	22.0
LSD (0.05)		2.68
p value		
CV		19.8

Table 9. THE EFFECT OF NITROGEN LEVELS AND FRUIT MATURITY ON TOMATO PEELING EFFICIENCY - 1995 (Fremont, OH).

FOLIAR SAMPLES TAKEN AT FIRST FRUIT SET (July 5, 1995)

Cultivar: 'OH8245'

		Microgram/Gram of Solid										
Treatment	% Total N	P	K	Ca	Mg	Mn	Fe	B	Cu	Zn	Al	Na
0 lbs N/A	3.92	4506	37201	21978	4690	27.51	335.6	34.41	17.06	18.13	481.9	162.1
50 lbs N/A	5.46	4302	37691	23067	5182	30.57	404.8	33.85	18.11	21.68	582.5	203.3
100 lbs N/A	5.73	4278	37668	25375	6006	36.42	383.6	36.70	17.82	25.35	555.0	204.0
150 lbs N/A	5.53	4226	35202	24255	5864	39.24	328.6	35.02	17.33	25.40	446.5	187.0
LSD (0.05)	0.65	NS	NS	NS	NS	NS	NS	NS	NS	4.50	NS	NS
p value		0.852	0.725	0.357	0.056	0.072	0.826	0.138	0.734		0.852	0.393
CV		8.6	7.6	10.0	13.3	19.3	29.1	4.6	6.5		37.1	17.2

Cultivar: 'Peto 696'

		Microgram/Gram of Solid										
Treatment	% Total N	P	K	Ca	Mg	Mn	Fe	B	Cu	Zn	Al	Na
0 lbs N/A	3.63	5332	42426	16410	4554	30.50	311.9	37.65	18.95	24.20	443.53	161.9
50 lbs N/A	4.96	4419	38117	24684	5644	35.55	324.2	35.52	15.25	21.57	446.03	232.0
100 lbs N/A	5.41	4758	41715	22005	6187	37.48	239.2	37.60	17.06	28.85	284.57	194.8
150 lbs N/A	5.84	5069	42724	22542	6455	45.76	258.1	39.06	18.84	30.58	306.63	194.3
LSD (0.05)	0.40	NS	NS	4408.5	908.0	6.31	NS	NS	2.59	5.46	NS	NS
p value		0.121	0.245				0.239	0.383			0.202	0.238
CV		10.3	8.4				20.9	6.4			32.6	21.1

Cultivar: 'SO12'

		Microgram/Gram of Solid										
Treatment	% Total N	P	K	Ca	Mg	Mn	Fe	B	Cu	Zn	Al	Na
0 lbs N/A	3.87	4953	36979	21032	4673	33.65	428.9	35.10	17.10	24.07	650.8	160.6
50 lbs N/A	4.99	5257	41082	22706	5598	35.48	431.6	35.08	18.76	27.31	643.3	196.1
100 lbs N/A	5.40	5079	40888	21328	6078	40.29	336.5	34.74	17.87	31.79	473.9	179.8
150 lbs N/A	5.73	4848	36910	25167	6117	48.25	305.7	38.53	22.68	29.91	400.9	179.3
LSD (0.05)	0.25	NS	NS	NS	786.5	10.26	NS	NS	NS	NS	NS	NS
p value		0.600	0.339	0.095			0.240	0.276	0.493	0.056	0.224	0.361
CV		7.1	9.5	10.4			24.7	7.4	23.6	13.9	32.7	13.0

Table 10. THE EFFECT OF NITROGEN LEVELS AND FRUIT MATURITY ON TOMATO PEELING EFFICIENCY - 1995 (Fremont, OH).

FOLIAR SAMPLES TAKEN AT HARVEST

Cultivar: 'OH8245'

		Microgram/Gram of Solid										
Treatment	% Total N	P	K	Ca	Mg	Mn	Fe	B	Cu	Zn	Al	Na
0 lbs N/A	4.45	5012	30420	36223	6813	27.34	223.2	46.90	33.46	26.31	257.9	173.7
50 lbs N/A	5.13	4616	30740	32519	6922	35.15	168.2	45.81	26.95	24.30	154.1	351.3
100 lbs N/A	4.82	4475	29271	32550	7422	47.37	130.3	51.54	28.61	24.82	105.9	348.4
150 lbs N/A	5.38	4401	33907	23149	7157	48.98	128.7	45.06	22.48	29.58	84.4	438.0
LSD (0.05)	NS	NS	NS	NS	NS	12.00	69.98	NS	NS	NS	104.67	NS
p value	0.121	0.451	0.580	0.100	0.531			0.671	0.331	0.313		0.159
CV	10.4	10.3	12.7	22.5	7.2			13.6	25.5	14.0		45.2

Cultivar: 'Peto 696'

		Microgram/Gram of Solid										
Treatment	% Total N	P	K	Ca	Mg	Mn	Fe	B	Cu	Zn	Al	Na
0 lbs N/A	4.36	5148	30844	37691	7104	35.61	255.5	41.16	41.20	25.90	315.8	209.5
50 lbs N/A	4.54	4939	31681	35167	7384	47.98	161.4	43.94	38.69	26.27	151.3	323.0
100 lbs N/A	4.70	4962	31473	30288	7684	61.21	186.4	41.53	33.36	28.57	193.0	402.5
150 lbs N/A	5.39	5733	37655	24700	7636	71.69	145.0	37.29	25.55	31.32	113.9	386.1
LSD (0.05)	NS	NS	NS	4216.0	NS	11.38	76.31	NS	NS	NS	107.15	NS
p value	0.153	0.072	0.133		0.319			0.233	0.149	0.173		0.090
CV	12.6	8.6	12.6		5.6			9.6	26.4	12.1		32.7

Cultivar: 'SO12'

		Microgram/Gram of Solid										
Treatment	% Total N	P	K	Ca	Mg	Mn	Fe	B	Cu	Zn	Al	Na
0 lbs N/A	4.94	6339	36466	30600	7254	44.09	236.1	34.75	30.15	36.13	263.6	184.6
50 lbs N/A	4.59	5609	36122	32333	7940	64.73	155.8	42.82	39.13	34.82	145.5	266.1
100 lbs N/A	4.80	5493	36206	27489	7385	71.67	116.4	41.36	36.53	31.66	86.7	313.5
150 lbs N/A	5.38	6286	39773	22785	7844	80.17	119.4	39.60	29.81	39.37	78.4	352.4
LSD (0.05)	NS	NS	NS	2833.3	546.0	15.75	56.28	NS	NS	NS	97.41	115.81
p value	0.448	0.156	0.459					0.145	0.124	0.095		
CV	11.9	9.9	8.3					11.6	17.7	11.2		

IRRIGATION AND MULCH COMBINATIONS FOR PEPPER PRODUCTION

Co-Investigators: Dr. Larry Brown and Ms. Brenda Miller, Dept. of Agricultural Engineering, Ohio State Univ.

Abstract: Fruit yields for two bell pepper cultivars ('North Star', 'Galaxy') and one jalapeno cultivar ('Mitla') were compared using raised bed production systems ranging from (1) no trickle irrigation or black plastic mulch, (2) trickle irrigation only, (3) black plastic mulch only, and (4) trickle irrigation plus mulch. This was the third year of this study.

Materials and Methods: Plots for all years were established at the OSU Horticulture Farm in Columbus, Ohio, on Kokomo silty clay loam. Plots (3 reps) were 25 feet long on 5 foot centers. Plants in 1995 were transplanted to the field on May 24 and 31. Mulch and trickle tape were applied prior to hand planting. Cultural practices for insect, disease and weed control followed standard practices. Trickle irrigation was used when irrometers in the plots indicated the need.

Harvest dates for 'North Star' (early maturing variety) were August 16, 29; September 13; and October 16. 'Galaxy' (later maturing) fruits were harvested August 29, September 13 and October 16. 'Mitla' (jalapeno) were harvested July 19; August 2, 29; September 13; and October 16.

Results and Discussion: Results in 1995 show statistical differences in fruit yields when comparing the different combinations of mulch/irrigation treatments. Optimum red T/A yields for 'North Star' and 'Galaxy' (17.1 and 13.8, respectively) were reached using both trickle irrigation and black plastic mulch and when using mulch alone without irrigation (14.7 T/A and 11.0 T/A, respectively). 'Mitla' yields were 31 T/A with black plastic mulch without irrigation (Table 11).

Results from 1994 show best red fruit yields for 'North Star' and 'Galaxy' were obtained also when using mulch alone or in combination with trickle irrigation. 'Mitla' yields in '94 showed no significant differences between treatments, however using mulch, irrigation or both yielded more marketable fruit per acre compared to the control using no inputs.

Results from 1993 show best yield for 'North Star' and 'Galaxy' were optimum when using mulch or mulch plus irrigation. Highest 'Mitla' yields were achieved with mulch only.

A three-year comparison of cultivars and treatments shows no statistical

differences, however, optimum yields for both 'North Star' and 'Galaxy' were obtained using mulch alone or mulch plus irrigation. Best fruit yields for 'Mitla' over a 3 year period were from plots with mulch alone or irrigation alone. However, there were no statistical differences among yields (Table 12).

Table 11. Irrigation/Mulch Combinations for Pepper Production, Columbus, OH - 1995

(Bell Peppers)

Cultivar	Irrigation	Mulch	Red #/A	Red T/A	Reds Avg. wt (lb)	Red #1/A	Red #1 T/A	Red #1 Avg. wt(lb)	Red #2/A	Red #2 T/A	Red #2 Avg. wt(lb)	Green #/A	Green T/A	Green Avg. wt (lb)	Green #1/A	Green #1 T/A	Green #1 Avg. wt(lb)	Green #2/A	Green #2 T/A	Green #2 Avg. wt(lb)	Cull #/A	Cull T/A
NORTH STAR	NO	NO	80267	10.4	0.26	35661	5.3	0.30	44605	5.1	0.23	71671	6.5	0.18	14868	1.7	0.23	56802	4.8	0.17	12778	3.6
	NO	YES	115695	14.7	0.25	65050	9.6	0.29	50646	5.1	0.20	112443	10.5	0.19	33106	4.0	0.24	79337	6.5	0.17	10271	0.9
	YES	NO	79337	10.4	0.26	39146	6.3	0.32	40191	4.1	0.20	74575	7.6	0.20	19166	2.6	0.27	55408	5.0	0.18	20444	2.5
	YES	YES	127660	17.1	0.26	71438	11.6	0.33	56221	5.5	0.19	118483	11.2	0.19	32060	4.1	0.26	86423	7.1	0.16	30899	3.3
GALAXY	NO	NO	40656	6.3	0.31	26717	4.8	0.36	13939	1.5	0.21	97691	10.9	0.22	38914	5.3	0.27	58777	5.6	0.19	8596	1.0
	NO	YES	66792	11.0	0.33	43095	8.3	0.38	23697	2.7	0.23	73181	9.5	0.26	38217	6.1	0.31	34964	3.4	0.20	11500	1.4
	YES	NO	51110	8.9	0.35	34151	6.8	0.40	16959	2.1	0.24	82357	10.5	0.25	35893	6.0	0.34	46464	4.5	0.19	13707	1.8
	YES	YES	82590	13.8	0.34	57615	11.0	0.38	24974	2.8	0.23	62959	8.2	0.26	29853	4.9	0.33	33106	3.3	0.20	16495	2.3
LSD (0.05)			19577.7	3.66	0.05	18557.2	3.33	0.03	10665.1	1.43	NS	NS	NS	0.02	NS	NS	0.03	24683.0	1.88	0.02	NS	NS
p value											0.568	0.084	0.326		0.431	0.161					0.076	0.412
CV			37.6	32.8	14.8	40.0	38.5	12.0	47.5	44.9	14.9	30.9	28.4	15.4	47.9	51.2	14.9	37.8	30.7	9.4	67.6	81.3

(Jalapeno)

	Irrigation	Mulch	Number Fruit/A	T/A	Avg. Fruit wt (lb)	# Culls/A	Culls T/A
MITLA	NO	NO	1317951	22.3	0.03	697	0.01
	NO	YES	1703719	31.0	0.04	3020	0.04
	YES	NO	1398450	24.1	0.03	6853	0.10
	YES	YES	1171938	21.9	0.04	1626	0.03
LSD (0.05)			NS	6.41	NS	NS	NS
p value			0.109		0.266	0.558	0.516
CV			20.3	19.3	6.5	72.6	56.1

Harvest Dates:
'North Star': Aug. 16, 29; Sept. 13; Oct. 16
'Galaxy': Aug. 29; Sept. 13; Oct. 16
'Mitla': July 19; Aug. 2, 29; Sept. 13; Oct. 16

Table 12. Three-Year Summary of Irrigation/Mulch Combinations for Pepper Production, Columbus, OH. (1993-1995).

Cultivar	Irrigation	Mulch	Red T/A	Green T/A	Cull T/A
North Star	No	No	6.9	3.1	3.7
"	No	Yes	10.7	4.8	2.5
"	Yes	No	7.1	3.7	2.8
"	Yes	Yes	12.2	5.5	2.9
Galaxy	No	No	4.0	5.2	1.5
"	No	Yes	7.6	5.1	2.0
"	Yes	No	6.1	5.3	2.1
"	Yes	Yes	9.7	4.7	3.4
LSD (0.05)			NS	NS	NS
p value			0.672	0.997	0.469
CV			65.2	82.3	45.2

Cultivar	Irrigation	Mulch	Marketable T/A	Culls T/A
Mitla	No	No	11.4	0.12
"	No	Yes	16.3	0.17
"	Yes	No	13.7	0.24
"	Yes	Yes	12.7	0.15
LSD (0.05)			NS	NS
p value			0.965	0.836
CV			77.5	83.6

COMBINING BIOPRIMED SEED AND CLEAR PLASTIC MULCH FOR EARLIEST SWEET CORN PRODUCTION

Objective:

Seedling establishment continues to be a key factor in profitable production of early fresh market sweet corn in Ohio. The use of clear plastic mulch over a trench of sweet corn can lead to a 10-14 day advantage in earlier harvest. This research tested untreated control and bioprimed sweet corn seed, alone and in combination with clear plastic mulch to determine if these treatments provide early, successful production of sweet corn for the Ohio market. Biopriming is a combination of seed hydration and inoculation of seed with a beneficial bacteria (Pseudomonas aureofaciens, strain AB254), which was originally developed for protection of sh_2 sweet corn from Pythium ultimum seed decay (Callan and Mathre, 1995).

Materials and Methods:

Two sweet corn varieties 'Seneca Daybreak' (se; yellow) and 'Double Gem' (se; bicolor) were planted in Columbus on April 27, 1995. Each cultivar was tested under 5 treatments: 1) bareground control, 2) bareground with bioprimed seed, 3) seed planted in trenches with clear plastic mulch 4) bioprimed seed planted in a trench and covered with clear plastic mulch, and 5) hydrated seed planted in trenches with clear plastic mulch. Rows were spaced 5 feet apart to accomodate mulch laying equipment. Each row measured 15 feet in length and seeds were planted 7 inches apart within rows. Each treatment was planted in six replications. When seeds began to germinate, the plastic was cut open to expose the plants. Stand counts were taken 14 days after planting and continued to 36 days after planting. Plant heights and plant dry weights were measured on treatments 47 days after seeding. Each cultivar/treatment was harvested twice; the first harvest occurred when ears reached optimum maturity for fresh market sales. The second harvest removed the second or smaller ear from the plants. Plant height, ear height, ear length and diameter and percent kernel moisture were measured and recorded from each treatment at the time of the first harvest.

Results and Discussion:

Plant heights and dry weight measurements (for both varieties) taken 47 days after seeding showed larger plants for those treatments planted in trenches with clear plastic vs. planting the seed into bareground (Table 13). However, during the 1995 growing season, heat units and degree growing days increased rapidly due to the warm temperatures. Harvest dates for 'Seneca Daybreak' were July 10 and July 19 for all treatments except those planted on bareground with bioprimed seed which were harvested on July 19 and July 25. 'Double Gem' trench/mulch treatments were harvested 5 to 9 days earlier than treatments planted in bareground. Ear measurements of length and diameter along with percent kernel moisture showed no significant differences between treatments for both cultivars. Both cultivars were harvested earlier when seed was planted in trenches and covered with clear plastic mulch without any decrease in ear size or quality.

Preliminary results from 1995 shows these practices may be feasible for Ohio growers to produce earlier, better quality sweet corn. This study will be repeated in 1996 to test if these results are consistent under different growing conditions. Results from 1995 will be reported at upcoming grower meetings, field days, and extension/research conferences.

Table 13. COMBINING BIOPRIMED SEED AND CLEAR PLASTIC MULCH FOR EARLIEST SWEET CORN PRODUCTION - 1995
Columbus, OH.

Cultivar: 'SENECA DAYBREAK'

Treatment	Harvest Dates	PERCENT GERMINATION* 14 DAP	15 DAP	18 DAP	19 DAP	22 DAP	25 DAP	36 DAP	Measurements on 3 plants 47 Days after Seeding Plant Ht. (in)	Dry Wt. (g)	Marketable crates/A ** Harvest 1	Harvest 2	Total	Harvest Measurements Plant Ht. (in)	Ear Ht. (in)	Ear Length (in)	Ear Diam. (in)	% Kernel Moisture
Bareground Control	7/10, 7/19	41	61	77	78	79	80	80	20.0	46.8	119	45	164	46.5	9.7	7.6	1.5	78
Bareground/Bioprimed	7/19, 7/25	25	37	60	64	65	65	64	16.0	40.4	115	22	137	46.2	8.8	7.6	1.6	77
Trench/mulch control	7/10, 7/19	87	91	91	91	91	91	90	29.1	76.9	164	42	206	47.7	12.8	7.5	1.6	75
Trench/mulch bioprimed	7/10, 7/19	87	89	89	89	89	89	89	28.2	78.7	150	59	209	48.9	13.7	7.5	1.6	75
Trench/mulch hydrated	7/10, 7/19	87	88	90	90	90	88	88	25.0	78.1	144	51	195	48.2	11.5	7.4	1.5	75
LSD (0.05)		10.8	8.6	10.5	10.8	10.9	11.7	11.9	4.76	15.65	NS	NS	NS	NS	2.77	NS	NS	NS
p value											0.369	0.353	0.095	0.574		0.814	0.836	0.160
CV											34.8	71.3	29.8	6.7		4.4	9.7	3.3

Cultivar: 'DOUBLE GEM'

Treatment	Harvest Dates	PERCENT GERMINATION* 14 DAP	15 DAP	18 DAP	19 DAP	22 DAP	25 DAP	36 DAP	Measurements on 3 plants 47 Days after Seeding Plant Ht. (in)	Dry Wt. (g)	Marketable crates/A ** Harvest 1	Harvest 2	Total	Harvest Measurements Plant Ht. (in)	Ear Ht. (in)	Ear Length (in)	Ear Diam. (in)	% Kernel Moisture
Bareground Control	7/19, 7/25	28	55	72	79	83	84	84	16.7	40.2	116	30	146	51.0	11.1	7.6	1.8	76
Bareground/Bioprimed	7/19, 7/25	23	42	65	69	76	76	74	15.5	35.1	91	18	109	52.7	11.8	7.5	1.8	77
Trench/mulch control	7/10, 7/19	93	93	93	93	93	93	93	26.8	65.8	130	73	203	52.3	12.5	7.6	1.6	78
Trench/mulch bioprimed	7/14, 7/25	93	95	95	95	95	95	93	25.8	58.9	142	59	201	52.7	13.0	7.5	1.6	77
Trench/mulch hydrated	7/10, 7/19	93	94	94	95	95	95	95	27.5	61.0	122	73	195	54.3	14.2	7.4	1.6	79
LSD (0.05)		10.7	10.2	12.1	9.5	9.1	9.3	9.7	3.85	9.79	NS	46.7	32.7	NS	NS	NS	NS	NS
p value											0.162			0.808	0.168	0.628	0.445	0.070
CV											30.3			8.4	17.5	4.0	11.5	2.4

* DAP = days after planting
** crate = 56 ears

Cultural Practices and Spray Applications for Tomato Plot - 1995
Vegetable Crops Branch, Fremont, OH.

Spacing, DCPTA, ACA, and Nitrogen Peeling Studies:

October, 1994	Broadcast 550 lb/A 0-11-46 and 1 ton/A lime Moldboard plowed Broadcast 1.5 bu/A winter rye for cover crop
April 1, 1995	Broadcast 1.25 qt/A Roundup to rye cover crop
May 6	Disked under rye cover
May 16	Half N applied to treatments as granular 34-0-0 with Gandy drop spreader (Nitrogen/Peeling Study only)
May 22	Broadcast 220 lb/A 34-0-0 over beds 0.5 lb/A Sencor Solupak + 1.25 pt/A Trifluralin 4EC and incorporated 2 inches deep
June 15	Second half of fertilzer treatments applied; Ammonium nitrate (34-0-0) banded (Nitrogen/Peeling Study only)
June 30	Foliar spray application on DCPTA treatment 0.1 g per 3 gal H_20 applied with backpack sprayer
June 26	Bravo 720 2.0 pt/A + Champ Formula 2 (Copper Hydroxide) 1.5 pt/A + Sevin XLR Plus 1.0 qt/A
July 8	Ensign (Chlorothalonil) + Champ Formula 2F 2.0 pt/A + Sevin XLR Plus 2 qt/A
July 19	Sencor DF .46 lb/A
July 21	Ensign 3.0 pt/A + Champ Formula 2F 2.5 pt/A + Sevin XLR 1.5 qt/A
July 29	Ensign 3.5 pt/A + Champ Formula 2F 2.5 pt/A + Asana XL 9.0 oz/A
August 7, 14	(Applied to spacing/population, ACA, and DCPTA plots) Ensign 4.0 pt/A + Benlate 50WP 0.5 lb/A

August 21 (Applied to spacing/population ('OH8245'), ACA, and DCPTA plots): Ensign 4.0 pt/A + Asana XL 9 oz/A

Ethrel Applications:

Aug 3 Spacing study ('H7135') and N/Peeling study ('SO12') - 1.5 pt/A

Aug 7 Spacing study ('P696') and N/Peeling study ('P696') - 1.5 pt/A

Aug 12 Spacing study ('OH8245'), N/Peeling study ('OH8245') and ACA ('H7135') - 0.75 pt/A

Aug 19 ACA ('OH8245'), DCPTA ('H7145') - 0.75 pt/A

Weather Data - Fremont, OH - 1995:

Month	Rainfall (inches)	Long-Term Rainfall Average (inches)
April	4.47	3.39
May	4.78	3.57
June	3.05	3.96
July	3.50	3.86
August	3.44	3.47
September	1.14	3.00
Season Total	20.38	21.25

	Season Average Temperatures		Long-Term Averages	
Month	Min. (°F)	Max. (°F)	Min.(°F)	Max.(°F)
April	34.7	55.4	38.0	59.0
May	48.2	68.9	48.3	70.5
June	59.4	80.4	58.0	80.1
July	62.0	85.6	61.9	84.1
August	64.1	85.4	59.5	82.0
September	46.4	73.0	52.2	75.4

Cultural Practices and Spray Applications for Irrigation/Mulch Pepper Plot - 1995; OSU Horticulture Farm, Columbus, OH.

Fall 1994	Moldboard plowed
May 16, 1995	Disked, field cultivated and rototilled 90 lbs N/A (33-0-0) incorporated
May 22	Applied Treflan @ 2 ½ pts/A
May 24	Planted open beds; applied 8 oz/plant starter fertilizer (10-52-10)
May 31	Plastic mulch and trickle lines installed
May 31	Planted mulched beds; applied 8 oz/plant starter fertilizer (10-52-10)
July 12	15 lbs N/A (15-0-0) applied with Gandy applicator
July 28	Orthene 1 lb/A + Kocide 1 lb/A
July 31, Aug. 24	Nitrogen injection (15 lbs/A) through trickle lines to all irrigated beds
Aug. 4, 11, 18, 25; Sept. 1, 8, 15	Orthene 1 lb/A + Kocide 1 lb/A
Aug. 10	15 lbs N/A (15-0-0) applied to non-irrigated beds

Cultural Practices and Spray Applications for Bioprimed Sweet Corn - 1995; OSU Horticulture Farm, Columbus, OH.

Fall 1994	Fall plowed
April 19, 1995	85 lbs N/A (33-0-0) incorporated Disked and field cultivated
April 26	Bladex 1.2 qt/A + Lasso 2 qts/A
April 27	Trenched, seeded and installed plastic mulch

May 17; June 7, 26
Sevin XLR 1 qt/A

July 11 Thiodan EC 1 qt/A

Weather Data, Columbus, OH - 1995.

Month	Rainfall (inches)	Long-Term Rainfall Average (inches)
April 12-20	2.33	-
May	6.53	4.18
June	8.75	4.38
July	5.93	4.57
August	6.38	3.76
September	1.15	2.91
October	4.67	2.45
Season Total (May - Oct)	35.74	22.25

Weather Data, Columbus, OH. 1995 (continued)

	Season Average Temperatures		Long-Term Averages	
Month	Min. (°F)	Max.(°F)	Min.(°F)	Max(°F)
May	49.9	70.9	50.3	72.6
June	61.8	83.1	59.4	81.3
July	64.5	85.7	63.2	85.2
August	67.8	87.6	61.7	83.5
September	51.8	75.0	54.7	77.4
October	44.5	66.6	43.2	65.8

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